WPT at Philips and the Ki standard

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Philips Intellectual property & Standards
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PHILIPS

What is Ki

- **What is Ki?**
- It is the new standard for appliances in our kitchen.
- The convenience to remove power cords.
- Ki offers a better and modern design.
- One appliance will work, regardless of the electrical standard in the world.
- It is safer. Water and electricity aren’t friends.
- The cooktop can be used as before.

- **How is Ki working**
- No batteries are used, so no leaking batteries.
- It is easier to use, just put the appliance in place and turn it on.
- The appliance is wirelessly powered from the cooktop, or a supporting induction hob.
- The appliance is only powered when it is used on the surface. It turns off when it is removed.

- **What is ki not!**
- It is NOT wireless charging. The power is available only when the appliance is used.

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Who Is The Wireless Power Consortium?

Founded in 2008, the WPC is an open standards development organization with a mission to establish and maintain global standards for safety, efficiency and interoperability of wireless power applications. WPC is the world's leading authority on wireless power transfer and a hallmark of trust, relied upon by millions of people in countless countries.

Nearly one billion devices will be shipped with the WPC's widely acclaimed Qi wireless power standard in 2024. Building on the success of Qi, WPC will launch its second major wireless power standard, Ki, later in 2024, bringing the unprecedented convenience, safety, and contemporary design of the Ki Cordless Kitchen to homes throughout the world.

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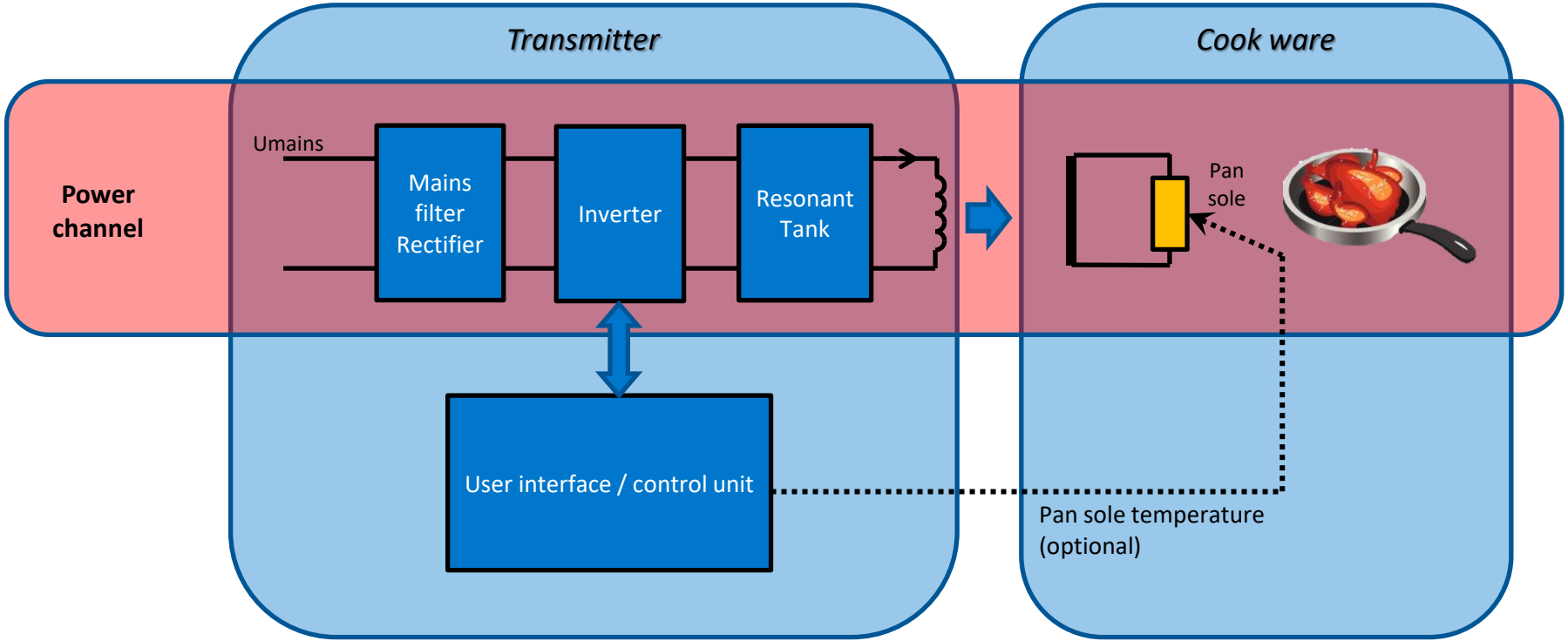
System Overview Conventional Induction Hob

(Optional) accurate control with temperature feedback



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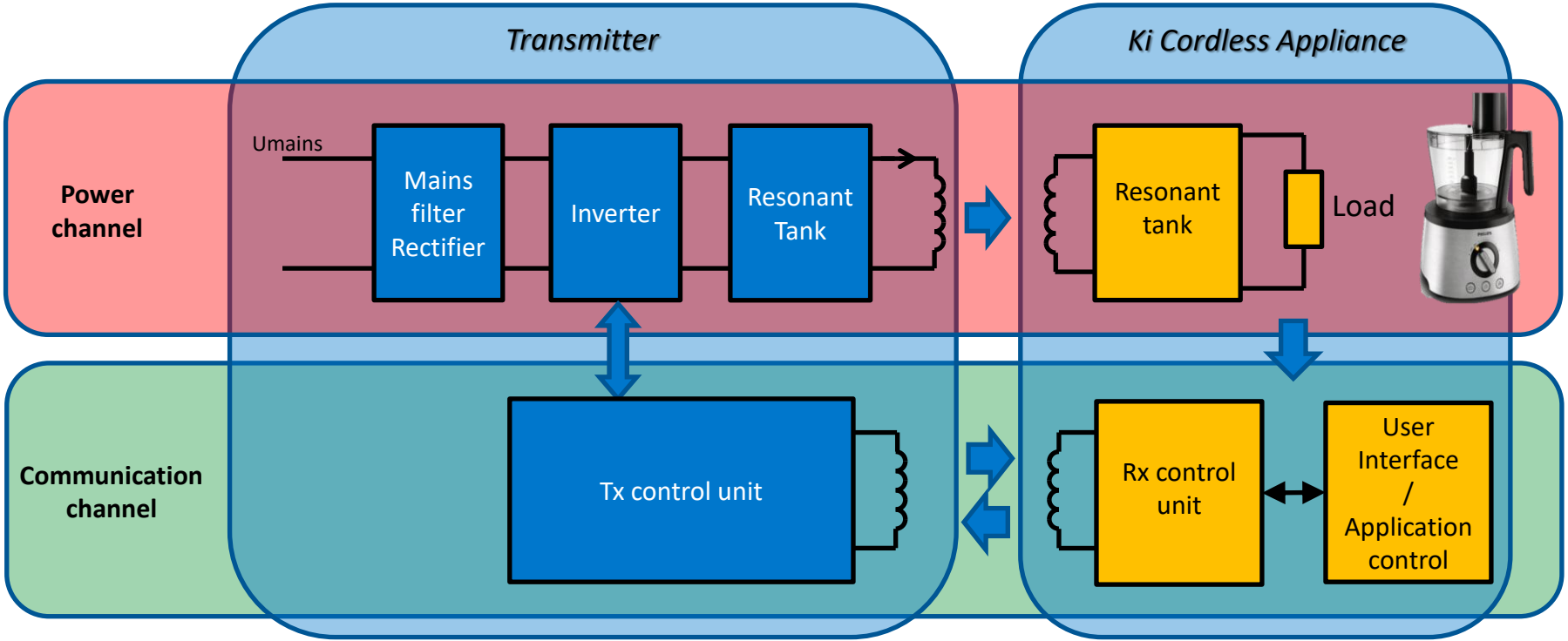
System Overview Ki Cordless Kitchen System

Architecture for Wireless Power Transmitter



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System Overview Ki Cordless Kitchen System

Differences between traditional Induction hob and KI

Induction Hob

- Simple technology and heats up any metal with magnetic permeability, like iron.
- Does not differentiate between "pans" and other objects.
- Slow output power regulation.
- ON-OFF cycling often used.
- Transmitter output power controlled through UI.

KI

- Ki is using NFC to communicate and transfer stand-by power (200mW).
- Authentication between Transmitter and Receiver.
- The appliance controls the transmitter output power through NFC.
- Ki requires continuous and accurate dynamic power control, no ON-OFF cycling.
- Power delivery must be started promptly (60 ms).
- The transmitter can be designed to support both Ki and traditional pans.
- Optionally features Foreign Object Detection.
- Any other objects, mobile or kitchen ware are not affected on the cooktop.

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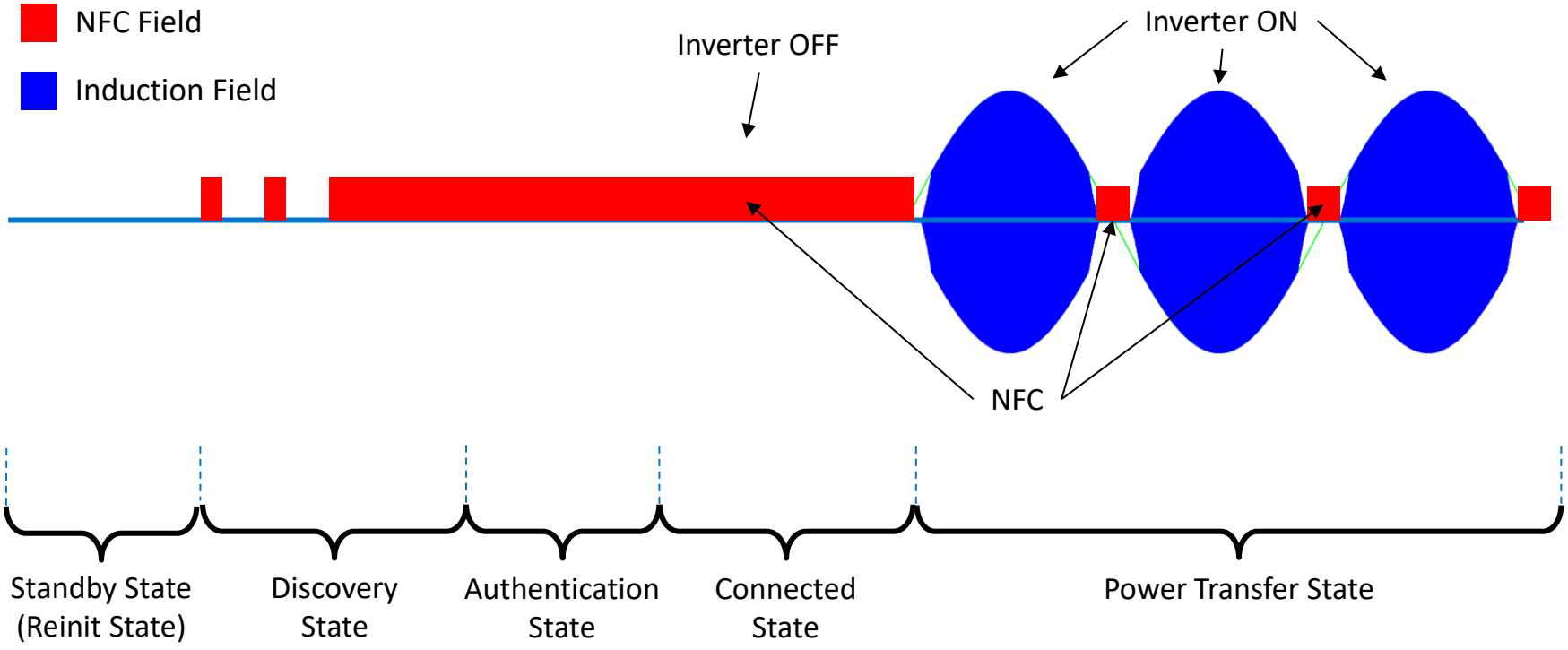
Ki Cordless Kitchen System States



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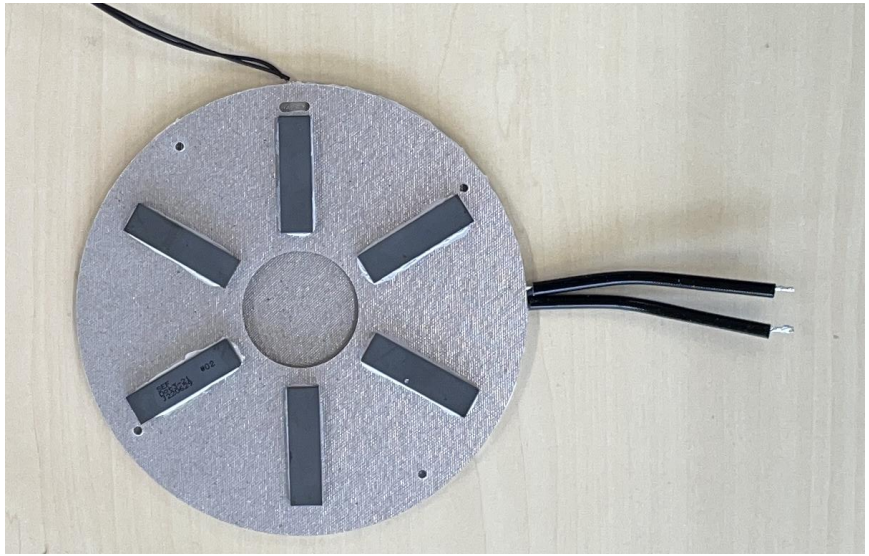
Receiver Power Coils & NFC Antennas

Example RRD3 receiver coil

RRD3 coil made by SEF Taiwan

Coil diameter	150 mm
NFC antenna diameter	170 mm
Power rating	2200 W



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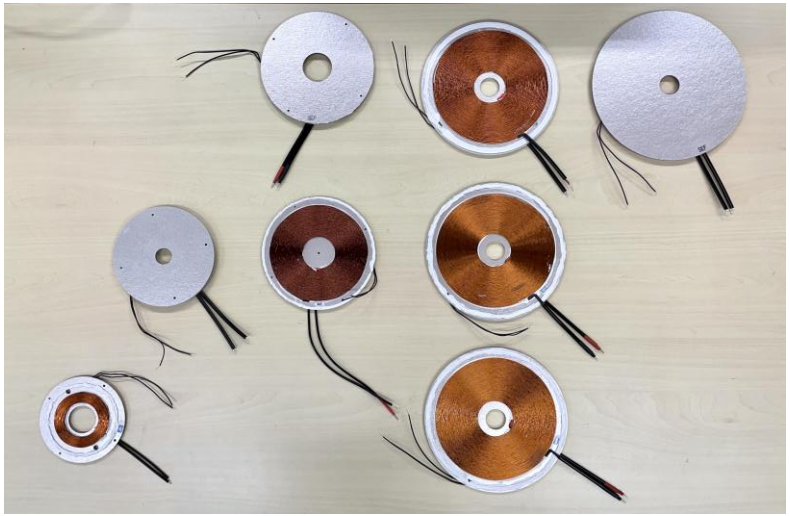
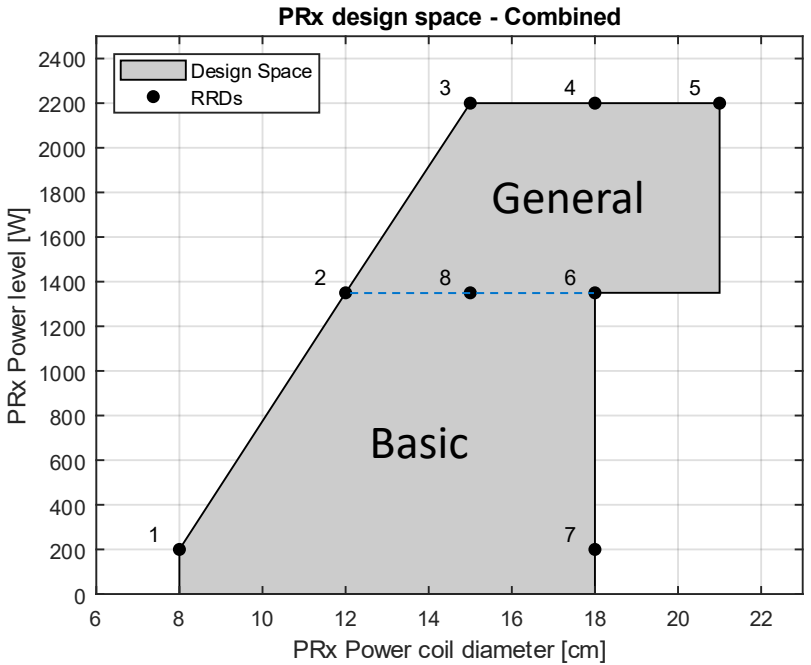
Receiver Power Coils & NFC Antennas

Power coil design based on Reference Receiver Designs (RRD)

Selection of RRD is SDA specific, optionally custom design can be used.
NFC antenna wound around power coil with 10 mm spacing





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Transmitter Power Coils & NFC Antennas

Example General Concealed Power Coil

- ID: 50 mm
- OD: 210 mm
- N: 20
- Pitch: 4 mm

- 2.75 mm litz wire

- L: 60 uH (integrated)
- Q: 230 (> 100)

- 6 ferrite strips

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Transmitter Power Coils & NFC Antennas

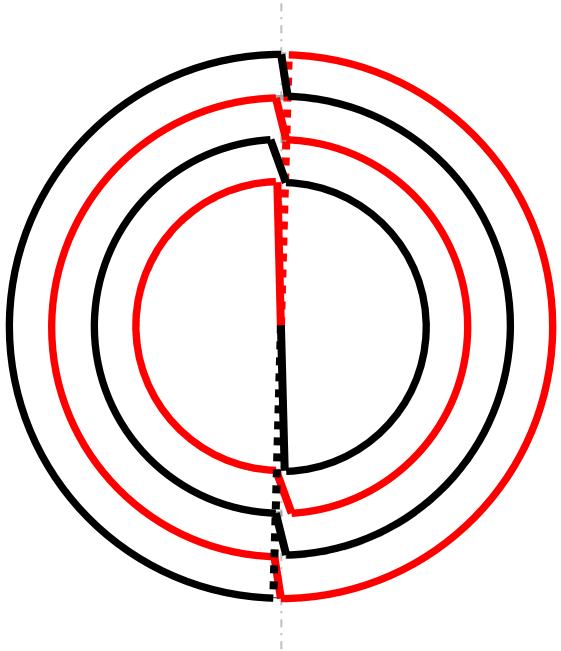
Example General Concealed NFC Antenna

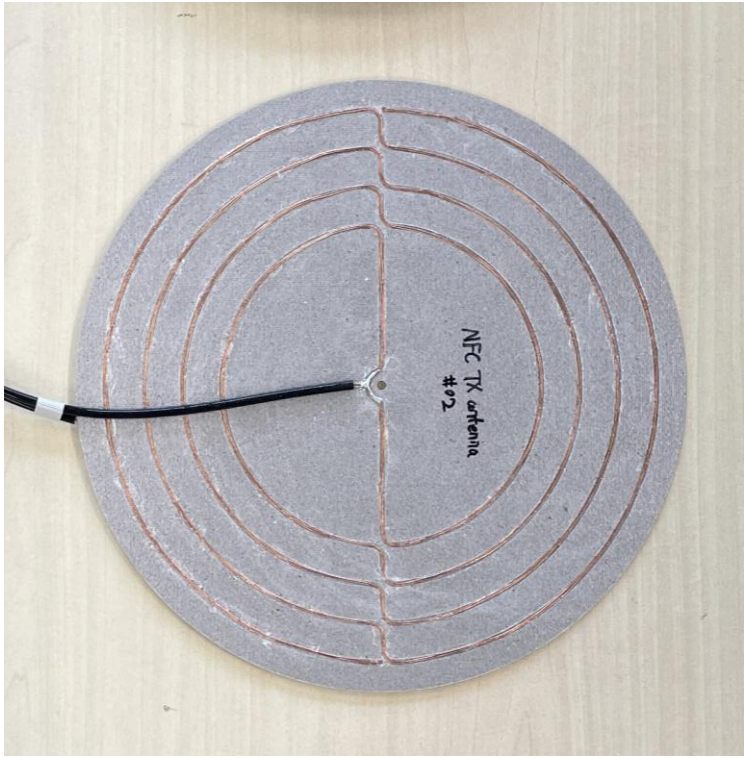
Widely spaced windings allow for good coupling of different PRx antennas

- ID: 100 mm
- OD: 220 mm
- N: 2
- 6 segments
- Pitch: 20 mm

- 1 mm PCB traces

- L: 1.2 uH (integrated)
- Q: 25.5 (with 2x1Ω)





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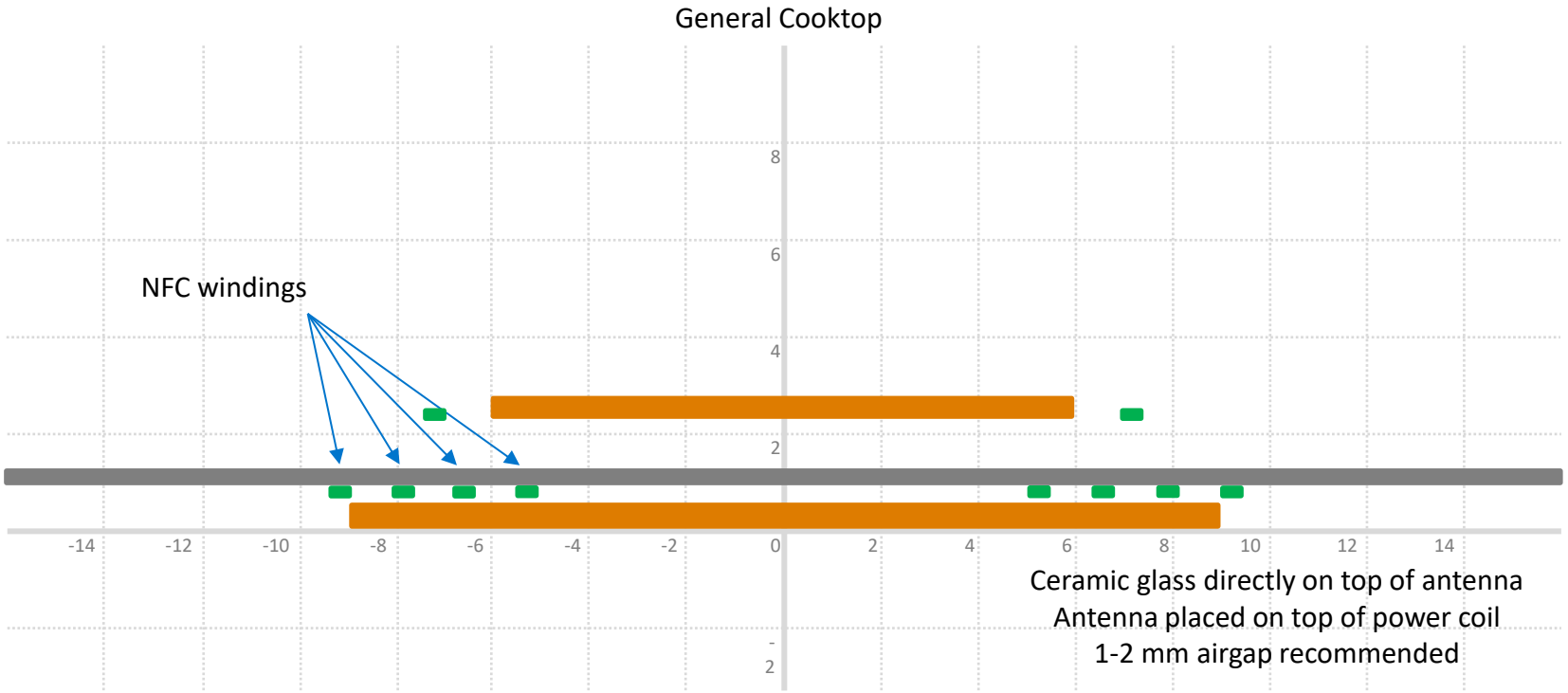
Power Coils & NFC Antennas



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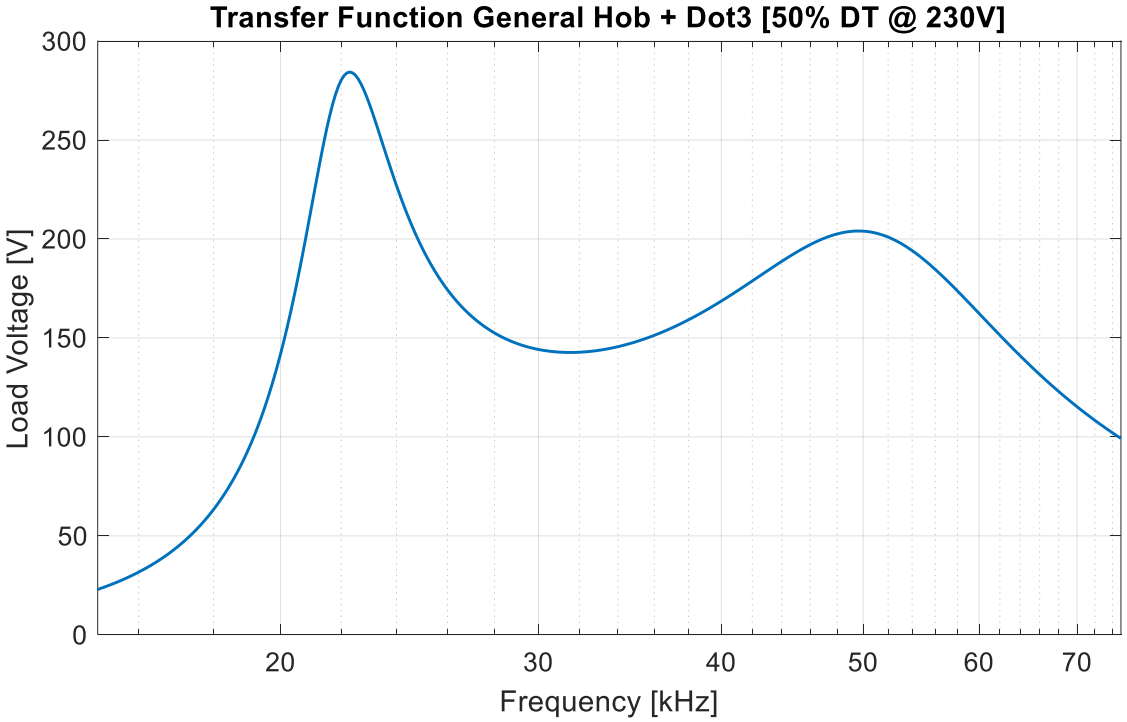
Power control

3 Means of power control:

1. Frequency control
   - At high coupling system can show two resonant peaks with positive phase some where between the peaks

2. Duty-cycle control
   - Duty-cycle is straight forward power control with linear relation between duty-cycle and power
   - Duty-cycle control needs enough phase margin in order to preserve zero-voltage switching

3. Phase cutting
   - At low power (<100W) Mains phase cutting is used to reduce power.



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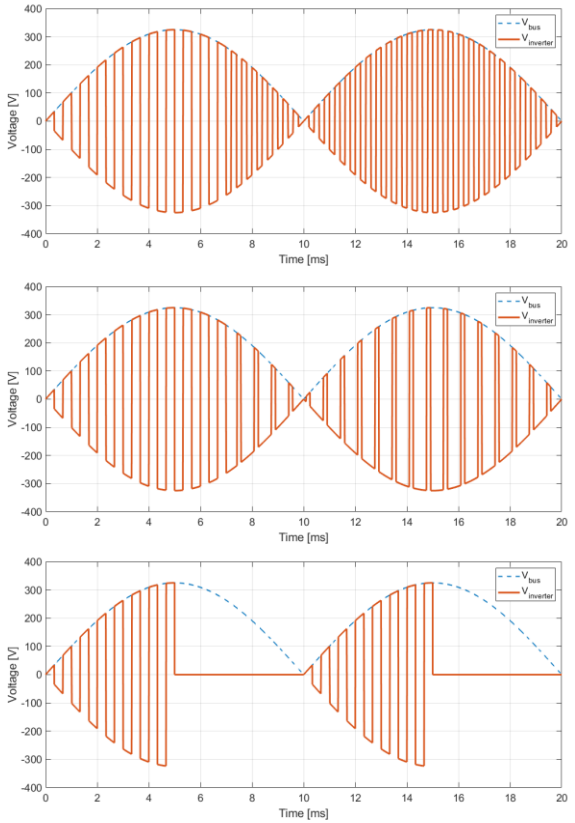

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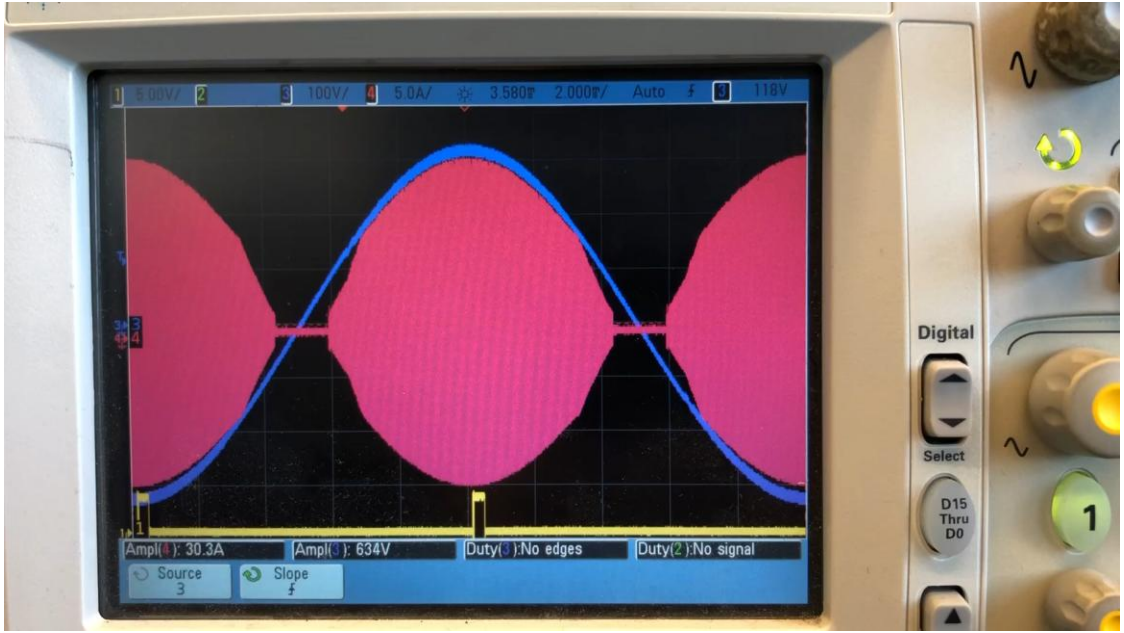

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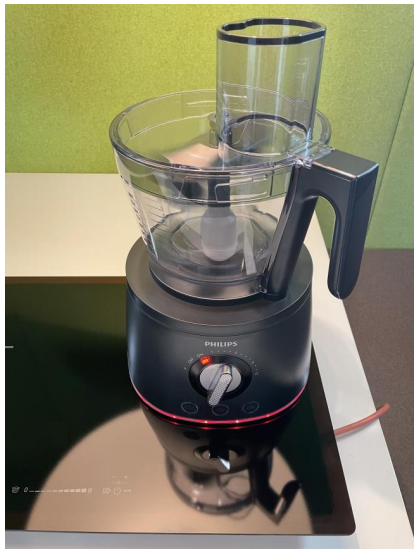
Dynamic Power Profile vs Static Power Profile

Dynamic Power Profile:

- Dynamic control of power
  - Power measurement required in PRx
- Continuous control using power request command
- Usually requires an MCU

Examples: Blender, Airfryer, Coffee maker



Static Power Profile:

- Static power control
  - No power measurement required in PRx
- Power level defined in NDEF -> ON/OFF command
- Simple NFC tags, no MCU

Examples: Water kettle, toaster, waffle maker

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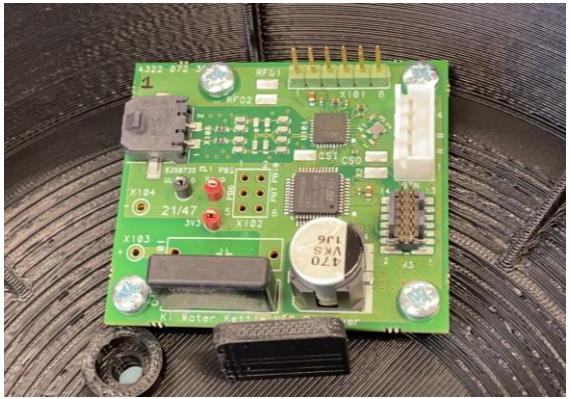
Example Ki SDA

Philips Water Kettle



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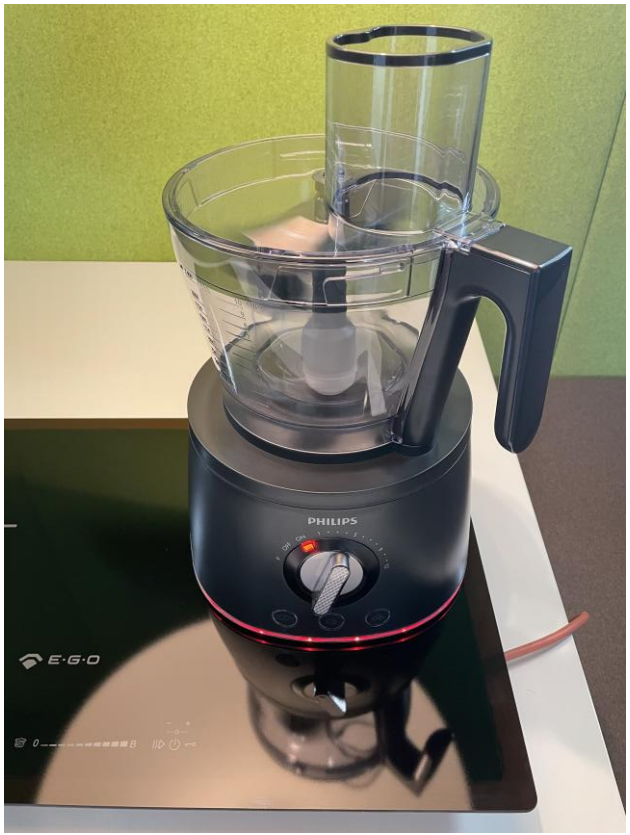
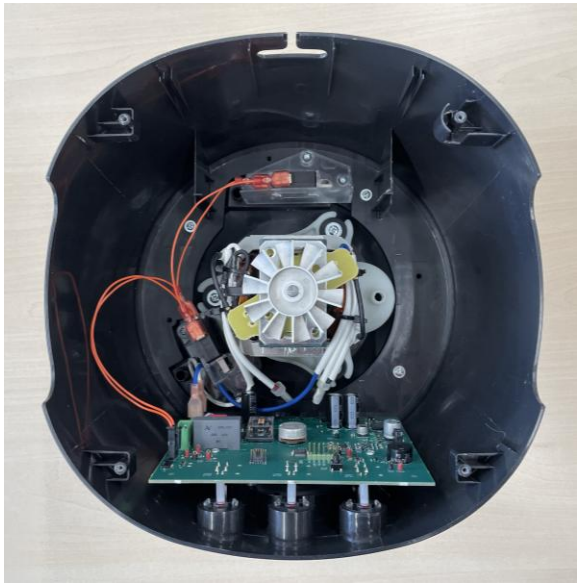
Example Ki SDA

Philips Blender





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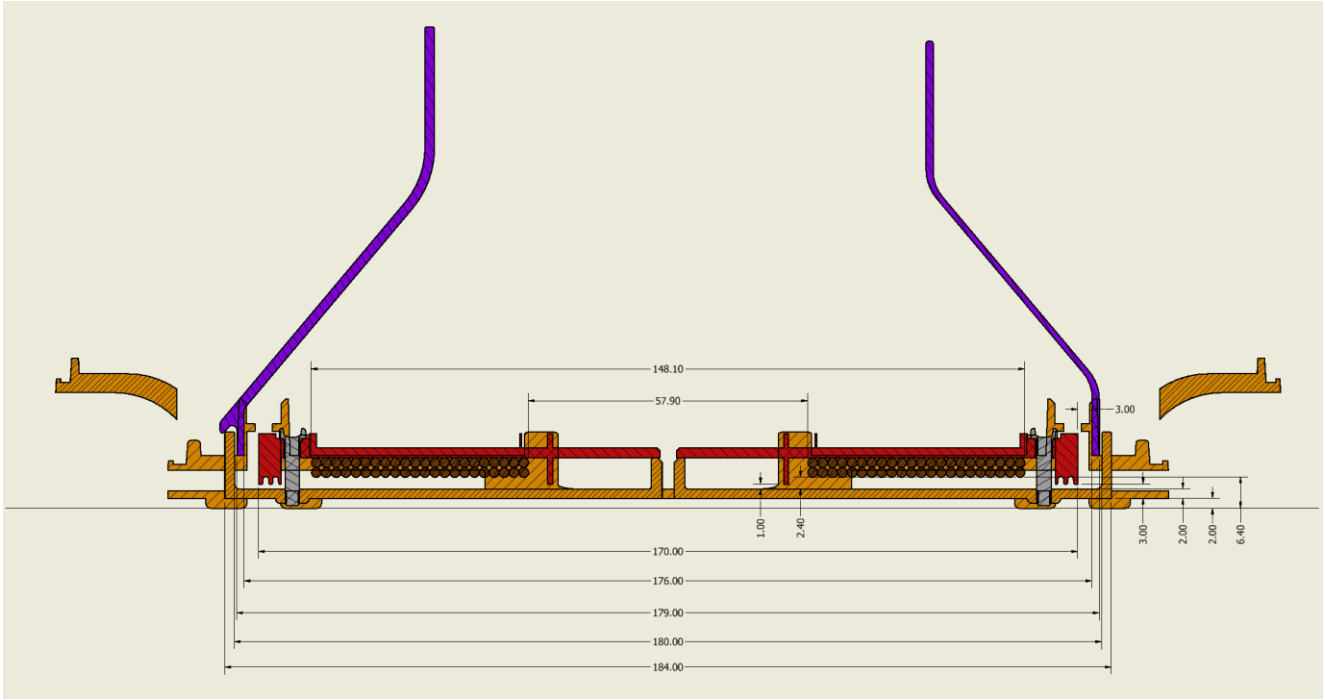
Integration of Power Coil in SDA Bottom



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Example Ki PTx

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Example Ki PTx

STM Reference Design

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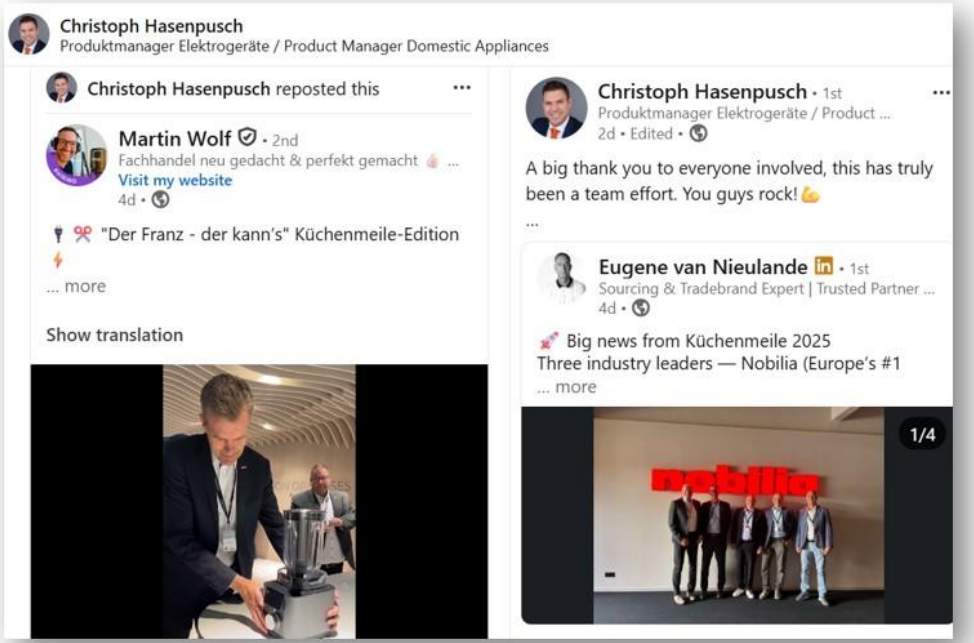
Current status of the Ki standard

- May 2025 first version of the Ki specification released
- Certification structure ready
- First company announcements made!
- More updates in development.



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Questions?

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